



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

Volume 8

NOVEMBER 15, 1922

Number 11

BACTERICIDAL PROPERTIES OF THE PRODUCTS OF RADIUM EMANATION

BY JOHN ALBERT MARSHALL

COLLEGE OF DENTISTRY, UNIVERSITY OF CALIFORNIA

Communicated, October 7, 1922

The following abstract deals with a description of the use of radium therapy in periapical infections,¹ and supplements a preliminary note² in which it was pointed out that solutions of the products of radium emanation possess distinct bactericidal properties. Additional data have been compiled but the analysis of them clearly indicates that with the present-day knowledge it is impossible to state definitely and conclusively why the products of the emanation produce such characteristic effects.

Although it was reported in 1909³ that radium exerts an inhibitory influence on pathogenic and non-pathogenic organisms, no further work was done in this field until ten years later, when the former observations were confirmed.⁴ Bacteria of various types were exposed to radium emanation with the result that a distinct inhibitory effect upon the cultures was observed.

In this present experiment a *solution* of the products of radium emanation is employed. The emanation tubes are usually discarded by the laboratories after they have undergone disintegration in respect to their content of gamma ray. However, they still contain in varying proportions radium A, B, C, and D. The effects which have been obtained are presumably not due to the hard gamma ray, but result in all probability from the action of the softer beta ray.

The radioactive solution is prepared as follows: a "de-emanated" emanation tube is placed in a sterilized mortar of about 20-cc. capacity, covered with Ringer's solution and then crushed with a pestle. On account of the rapidity with which the radio-activity of this solution diminishes, it is advisable to crush the tubes immediately before use. This solution is carried directly to the infected area by means of sterile dressings. In the case of chronic or acute apical abscesses, found about the roots of

teeth, the radioactive liquid is forced into the infected area through the pulp canal of the tooth and allowed to remain for 24 hours. Subsequently the dressings are removed, the canals tested for sterility and finally filled. With two possible exceptions there has been no evidence, after three years time, of succeeding soreness or pain. The individual dosage in terms of millicuries of gamma radiation has varied from .046 to .138.

Failures in this method of treatment have been recorded but the fact remains that sterile tests have been obtained more often by using the radioactive solution than in similar experiments with other antiseptic agents.

Summaries of experimental and clinical data are presented which indicate the variations in the pathology, age of patient, etiology, treatment, clinical result and laboratory findings.

In many instances tubes have been used in which de-emanation had proceeded to such a degree that it was not possible to obtain a reading by the electroscope. These have given similar results insofar as bactericidal action is concerned, but they have not caused the soreness which sometimes accompanies the use of solutions containing a recorded amount of gamma rays.

In general the cases selected have been those in which previous treatments were without satisfactory result. Dichloramin T, formocresol beechwood creosote, phenol, and other antiseptics of a similar nature had been used without producing a noticeable change in condition. In fact, the greater majority of the cases carried a history of unsuccessful treatment. Most of them yielded to the action of the radioactive solution.

The precautionary measures which are to be observed are naturally those referring to dosage and technique of application. Severe radium burns resulted in monkeys when emanation tubes containing eighteen millicuries were sealed into pulp canals of central incisors. These burns were so extreme that the hard palate and orbit were involved. It is believed to be impracticable to use the radium except as a solution of the solids. The tubes should be thoroughly crushed under Ringer's solution exactly at the moment of use, and it has been customary to have three or four patients prepared and ready at one time in order to secure the greatest economy of material. The limited availability of de-emanated tubes except at emanation laboratories is a serious drawback to an extensive application of this therapy. However, it is planned, if funds become available, to further extend these researches to include not only additional data upon dosage but also to report upon the application of other radioactive preparations which may be found to be more plentifully distributed.

¹ Marshall, John A., "Radium in Periapical Infections" (*in press*).

² Marshall, John A., "Bactericidal Action of Solutions of Radium Emanation," *Calif. State Med. J.*, Jan. 1922.

³ Iridell and Minett, "Notes of the Effect of Radium in Relation to Some Pathogenic and Non-Pathogenic Organisms," *Lancet*, 1909, 1, p. 1445.

⁴ Lequeux and Chrome, "Action of Radium on Bacteria," *Arch. Memo. Obst. gynec.*, 3, p. 698, Dec. 1919.

THE JADES OF MIDDLE AMERICA¹

BY HENRY S. WASHINGTON

GEOPHYSICAL LABORATORY, CARNEGIE INSTITUTION OF WASHINGTON

Communicated October 4, 1922

The following pages present some of the results of a study of jade beads, disks, and other small objects, found in a *cenote*, or sacred natural well, at the ancient Maya city of Chichen Itza, in northern Yucatan, the petrographic study of which was kindly entrusted to me by Prof. A. M. Tozzer of Harvard University. The final results will be incorporated in a forthcoming archaeological monograph on the contents of the cenote, under the editorship of Prof. Tozzer. In connection with this study, I have also been able to examine some ancient Mexican beads, through the kindness of Dr. L. Salazar, Director of the Geological Survey of Mexico, and some jade objects from Copan, Honduras, which were kindly placed at my disposal by Dr. Sylvanus G. Morley. I am deeply indebted to Dr. H. E. Merwin, of this Laboratory, for numerous optical determinations.

There is great variety in all the characters, chemical, mineral, and physical, of the Chichen Itza and other American jades. There are two dominant colors: green and gray. Some objects are wholly of a deep, rather yellowish green, like Ridgway's "pistachio green," or of a grayish green, like Ridgway's "pea green," the first being used for the choicest objects. The grays vary from almost pure white, through ash-, gull-, and dove-gray, to rather dark gray, most of the gray specimens being mottled in lighter and darker shades. Another and common type is mottled white (or very light gray) and a clear, bright, grass-, or emerald-green. A few obsidian beads were also found at Chichen Itza.²

The texture varies from decidedly coarse-grained, as are most of the pistachio-green and mottled green and white specimens, to very fine grained, as are most of the pea-green specimens; the gray specimens are mostly moderately fine-grained. The coarse-grained pieces show glistening cleavage surfaces of pyroxene on the fracture. Nearly all these objects have a high to very high polish, which is most marked on the coarser and the pistachio-green varieties. The coarse varieties are rather translucent, as are some of the fine-grained pea-green beads; the whites and grays are generally opaque.